ABSTRACT

An experimental investigation was carried out to provide a better understanding of the flame propagation between a flat roofing and photovoltaic installations in order to determine the influence of gap distance on the fire spread potential. Horizontal flame propagation along a combustible surface with a parallel incombustible surface above was studied experimentally for varying gap distances (10 cm to 25 cm). A 30 mm wide polymethylmethacrylate (PMMA) slab and a stainless-steel sheet was used as a surrogate for a combustible roofing material and an incombustible photovoltaic (PV) module, respectively. The advancement of the flame front and mass loss rate was measured, and so was temperatures of the PMMA slab, gas phase temperatures in the gap and radiative heat flux. For tests with gap distance of more than 20 cm, constant flame spread rates were achieved and the burning velocity of 0.15 – 0.20 mm/s is comparable to a free burning scenario. However, for smaller gap distances, the flame spread had a growing phase followed by rapid acceleration once the flames impinged the modules. A resultant flame spread rate of 2 mm/s was recorded for all gap distances smaller than this critical value. Thus, the experimental investigation revealed the significance of a critical gap distance for PV installations above which the horizontal flame spread hazard could be minimised. Similar experiments carried out with actual PV modules concur with the trends observed in the experimental set-up. The findings can form a preliminary understanding of the impact of a PV panels on flames propagating along the roof.